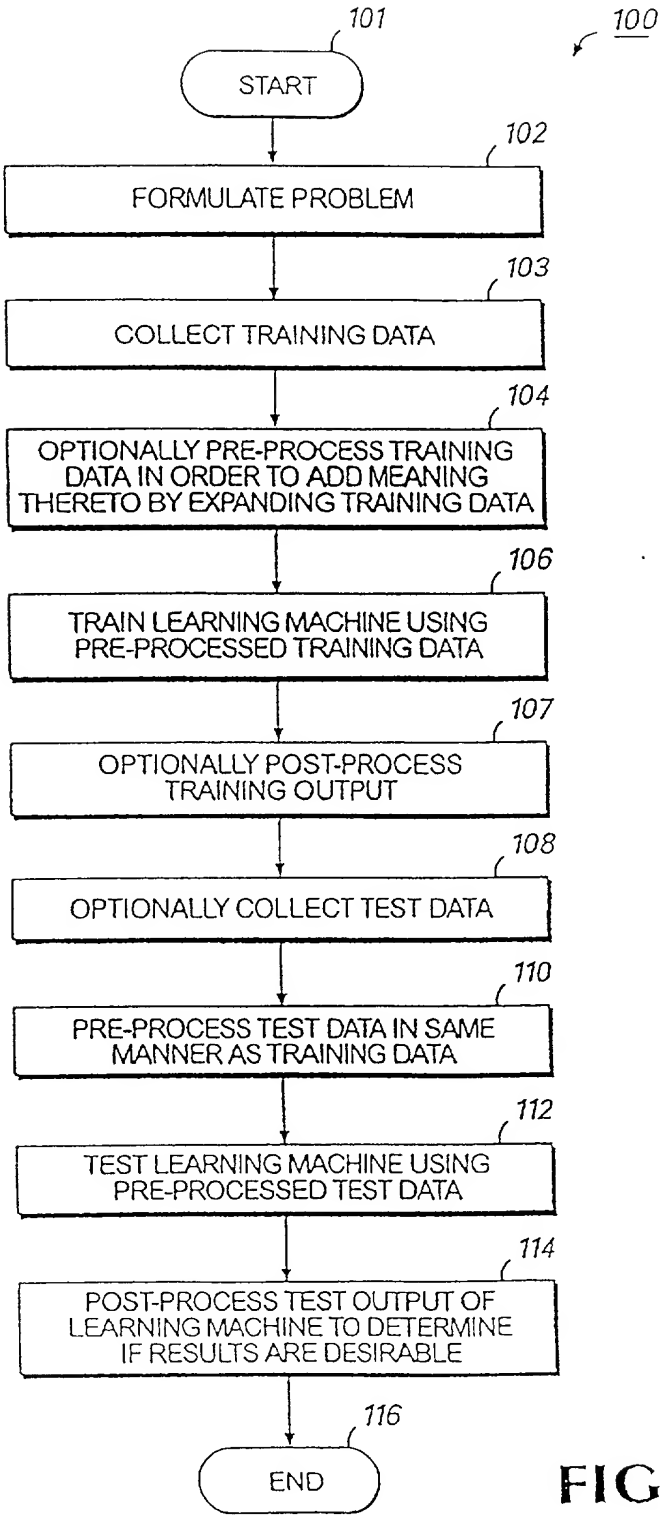

100
101
START
102
FORMULATE PROBLEM
103
COLLECT TRAINING DATA
104
OPTIONALLY PRE-PROCESS TRAINING DATA IN ORDER TO ADD MEANING THERETO BY EXPANDING TRAINING DATA
106
TRAIN LEARNING MACHINE USING PRE-PROCESSED TRAINING DATA
107
OPTIONALLY POST-PROCESS TRAINING OUTPUT
108
OPTIONALLY COLLECT TEST DATA
110
PRE-PROCESS TEST DATA IN SAME MANNER AS TRAINING DATA
112
TEST LEARNING MACHINE USING PRE-PROCESSED TEST DATA
114
POST-PROCESS TEST OUTPUT OF LEARNING MACHINE TO DETERMINE IF RESULTS ARE DESIRABLE
116
END

FIG. 1

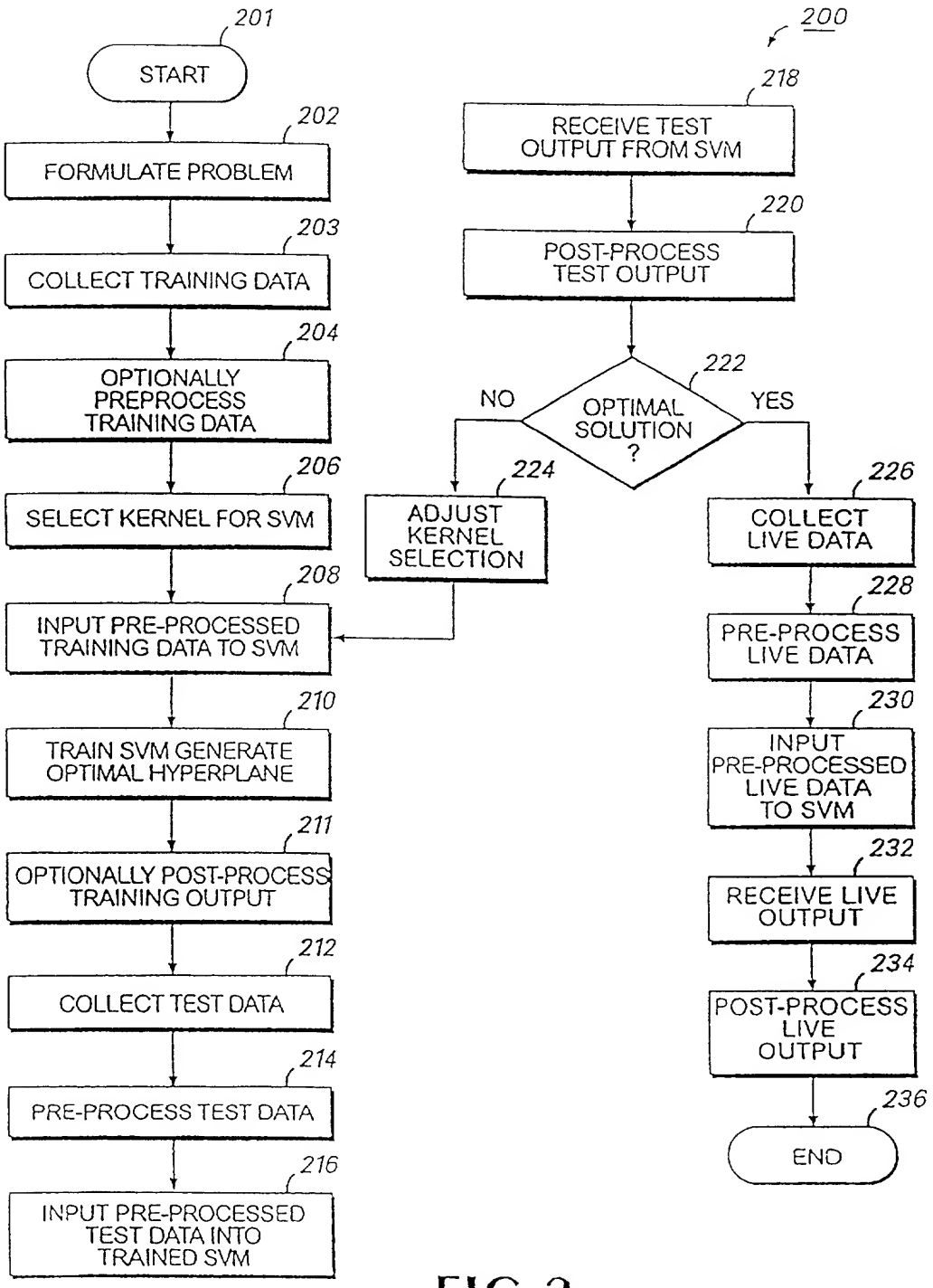

200
201
START
202
FORMULATE PROBLEM
203
COLLECT TRAINING DATA
204
OPTIONALLY PREPROCESS TRAINING DATA
206
SELECT KERNEL FOR SVM
208
INPUT PRE-PROCESSED TRAINING DATA TO SVM
210
TRAIN SVM GENERATE OPTIMAL HYPERPLANE
211
OPTIONALLY POST-PROCESS TRAINING OUTPUT
212
COLLECT TEST DATA
214
PRE-PROCESS TEST DATA
216
INPUT PRE-PROCESSED TEST DATA INTO TRAINED SVM
218
RECEIVE TEST OUTPUT FROM SVM
220
POST-PROCESS TEST OUTPUT
222
OPTIMAL SOLUTION ?
NO
YES
224
ADJUST KERNEL SELECTION
226
COLLECT LIVE DATA
228
PRE-PROCESS LIVE DATA
230
INPUT PRE-PROCESSED LIVE DATA TO SVM
232
RECEIVE LIVE OUTPUT
234
POST-PROCESS LIVE OUTPUT
236
END

FIG.2

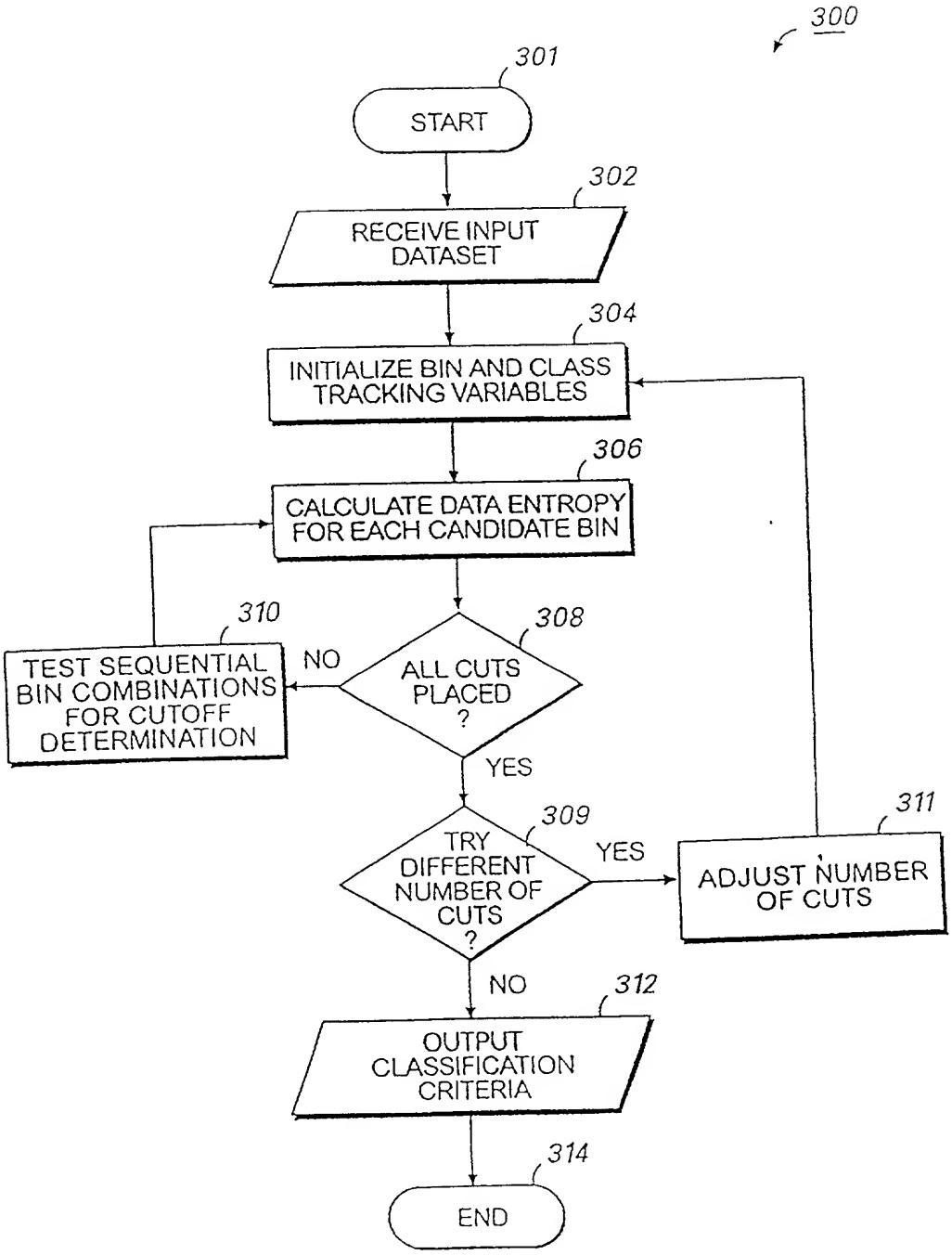

300
301
START
302
RECEIVE INPUT DATASET
304
INITIALIZE BIN AND CLASS TRACKING VARIABLES
306
CALCULATE DATA ENTROPY FOR EACH CANDIDATE BIN
308
ALL CUTS PLACED ?
NO
310
TEST SEQUENTIAL BIN COMBINATIONS FOR CUTOFF DETERMINATION
YES
309
TRY DIFFERENT NUMBER OF CUTS ?
YES
311
ADJUST NUMBER OF CUTS
NO
312
OUTPUT CLASSIFICATION CRITERIA
314
END

FIG. 3

406a	406b	406c	406d	406e	406f	
41	75	95	29	8	1	
47	64	45	26	4	1	
34	35	17	11	5	1	
48	5	137	18	2	1	
35	29	48	21	9	1	
49	19	69	11	7	1	
42	8	10	12	2	1	
44	3	12	14	1	1	
37	57	19	20	7	1	
48	17	14	12	1	1	
39	1	10	17	8	1	
44	21	14	17	1	1	
34	2	9	12	1	1	
31	10	10	16	0	1	
42	252	452	25	0	1	
42	59	693	19	1	-1	
36	5	51	12	1	-1	
38	1	10	19	1	-1	
36	43	89	9	1	-1	
42	16	10	13	4	-1	
47	19	20	12	1	-1	
49	14	128	21	4	-1	
38	169	315	36	0	-1	402
33	2	12	8	0	-1	
46	41	308	23	5	-1	
44	54	115	29	2	-1	
31	4	3	20	1	-1	
49	1	18	27	2	-1	
48	34	355	19	3	-1	
44	29	19	20	2	-1	
42	207	11	10	3	-1	
43	62	53	26	1	-1	
43	108	293	4	0	-1	
35	25	13	24	1	-1	
35	5	5	16	1	-1	
45	54	17	19	8	-1	
41	4	10	15	4	-1	
40	8	12	8	0	-1	
42	25	78	21	2	-1	
46	30	105	11	5	-1	
48	72	94	15	1	-1	
36	3	10	7	0	-1	
46	165	12	17	5	-1	
47	22	10	26	2	-1	
48	3	10	21	0	-1	
40	4	10	12	0	-1	
32	3	10	14	6	1	
36	51	167	11	3	1	
39	4	15	31	25	1	
46	2	10	8	0	1	
28	12	36	25	23	1	
32	23	50	19	0	1	
44	26	10	21	4	1	
47	32	11	21	7	1	
42	32	41	21	18	-1	
42	2	10	14	0	-1	
36	10	1	16	1	-1	
47	5	6	22	1	-1	
34	18	6	13	2	-1	
34	9	10	29	0	-1	
37	6	10	16	0	-1	
38	42	46	14	6	-1	
32	98	11	11	0	-1	
37	39	10	13	1	-1	
45	17	267	20	4	-1	404
39	93	134	12	1	-1	
43	47	11	19	11	-1	
46	6	10	13	1	-1	
49	1	4	19	6	-1	
46	172	302	9	3	-1	

FIG.4

606a1
606a3
606a
606a2
606b1-3
606b
606c1-3
606c
606d1-3
606d
606e1-3
606e
606f
602
604

FIG. 5

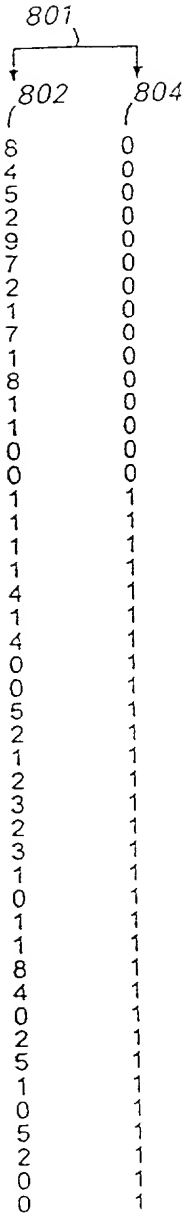

801
802
804
8 0
4 0
5 0
2 0
9 0
7 0
2 0
1 0
7 0
1 0
8 0
1 0
1 0
0 0
0 0
1 1
1 1
1 1
1 1
4 1
1 1
4 1
0 1
0 1
5 1
2 1
1 1
2 1
3 1
2 1
3 1
1 1
0 1
1 1
1 1
8 1
4 1
0 1
2 1
5 1
1 1
0 1
5 1
2 1
0 1
0 1

FIG. 6

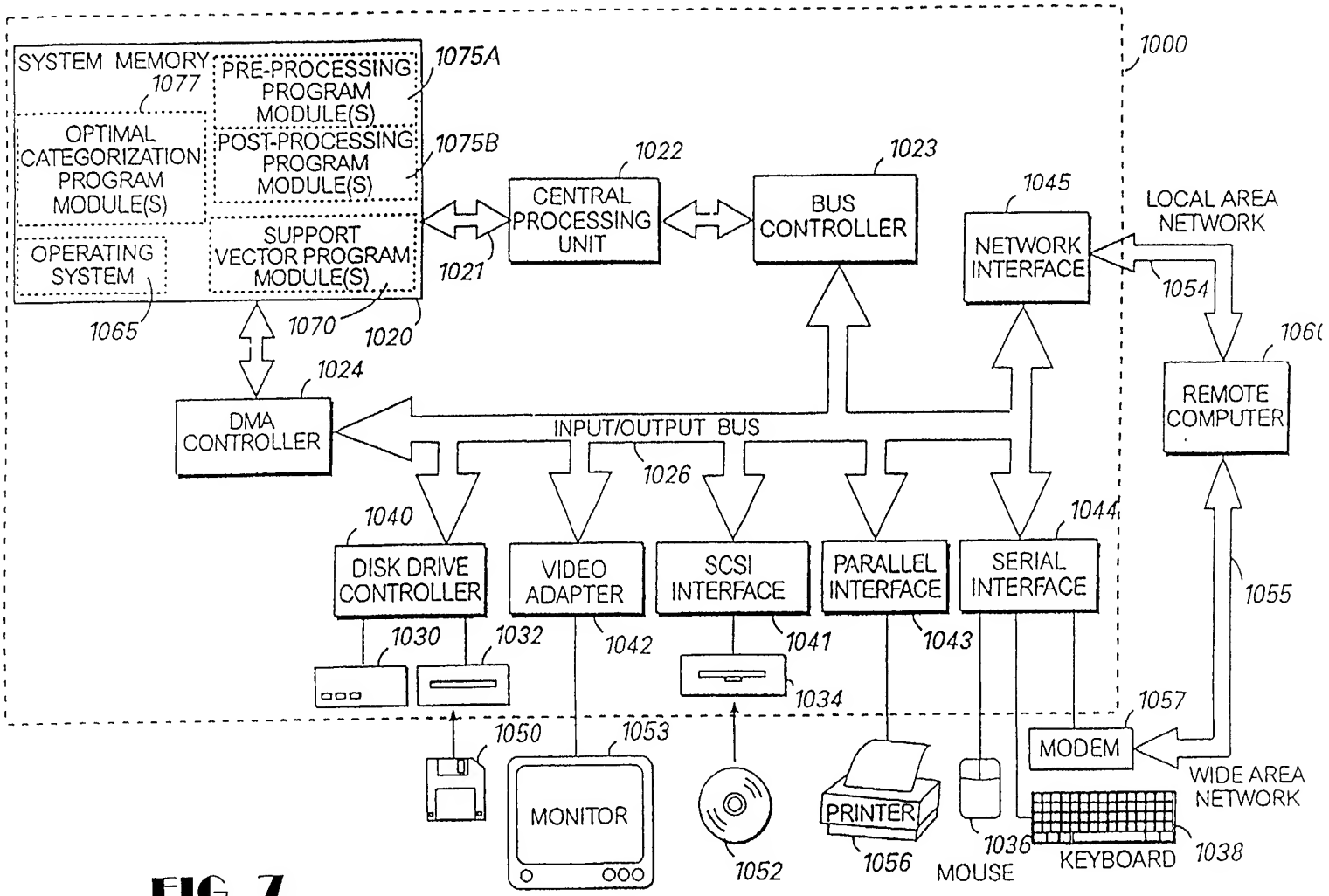

1000
SYSTEM MEMORY
1077
PRE-PROCESSING PROGRAM MODULE(S)
1075A
OPTIMAL CATEGORIZATION PROGRAM MODULE(S)
POST-PROCESSING PROGRAM MODULE(S)
1075B
OPERATING SYSTEM
SUPPORT VECTOR PROGRAM MODULE(S)
1065
1070
1020
1021
1022
CENTRAL PROCESSING UNIT
1023
BUS CONTROLLER
1045
NETWORK INTERFACE
LOCAL AREA NETWORK
1054
1060
REMOTE COMPUTER
1024
DMA CONTROLLER
INPUT/OUTPUT BUS
1026
1040
DISK DRIVE CONTROLLER
VIDEO ADAPTER
SCSI INTERFACE
PARALLEL INTERFACE
SERIAL INTERFACE
1044
1055
1030
1032
1042
1041
1043
1034
1057
1050
1053
MODEM
WIDE AREA NETWORK
MONITOR
PRINTER
1036
MOUSE
KEYBOARD
1038
1052
1056

FIG. 7

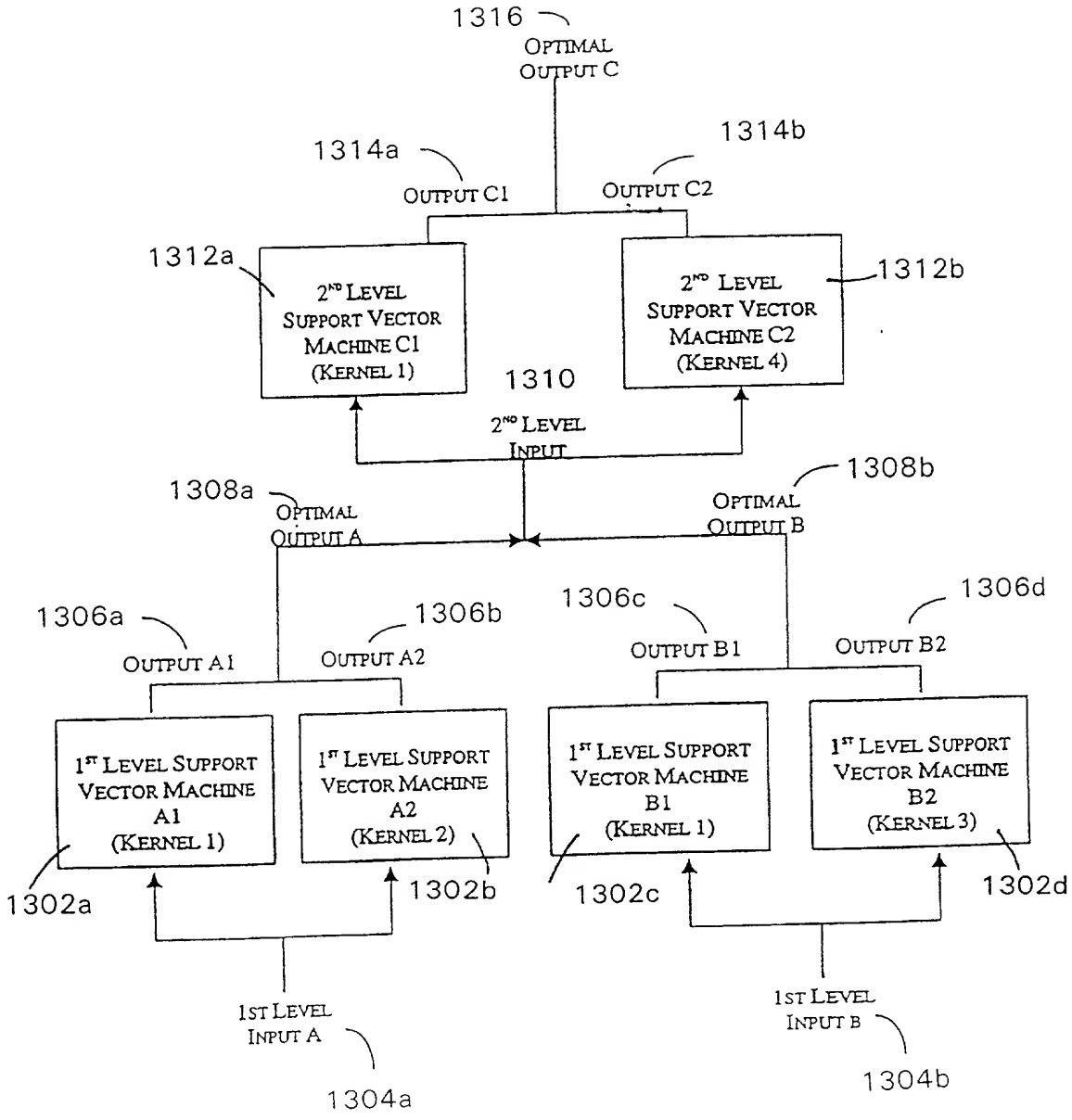

1316
OPTIMAL OUTPUT C
1314a
OUTPUT C1
1314b
OUTPUT C2
1312a
2ND LEVEL SUPPORT VECTOR MACHINE C1 (KERNEL 1)
2ND LEVEL SUPPORT VECTOR MACHINE C2 (KERNEL 4)
1312b
1310
2ND LEVEL INPUT
1308a
OPTIMAL OUTPUT A
1308b
OPTIMAL OUTPUT B
1306a
OUTPUT A1
1306b
OUTPUT A2
1306c
OUTPUT B1
1306d
OUTPUT B2
1ST LEVEL SUPPORT VECTOR MACHINE A1 (KERNEL 1)
1ST LEVEL SUPPORT VECTOR MACHINE A2 (KERNEL 2)
1ST LEVEL SUPPORT VECTOR MACHINE B1 (KERNEL 1)
1ST LEVEL SUPPORT VECTOR MACHINE B2 (KERNEL 3)
1302a
1302b
1302c
1302d
1ST LEVEL INPUT A
1ST LEVEL INPUT B
1304a
1304b

FIG. 8

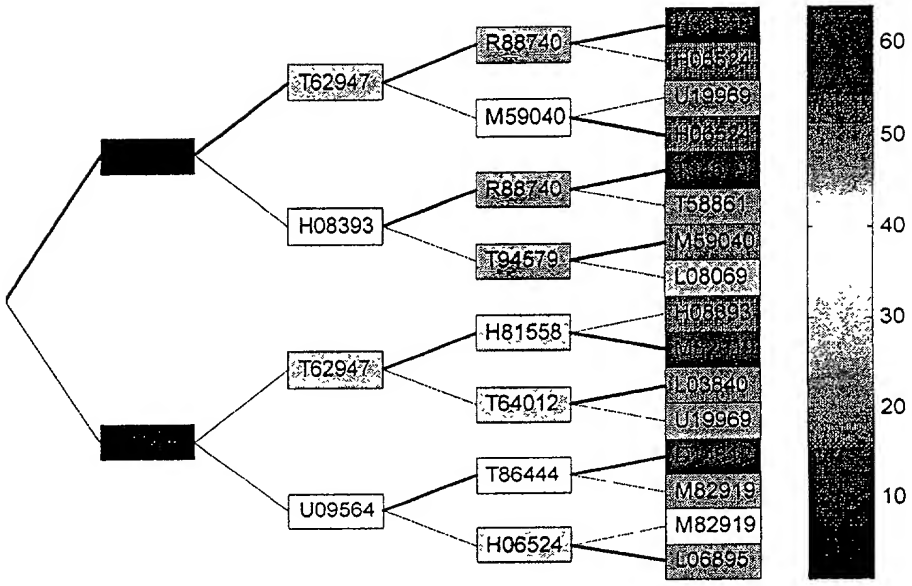

T62947
H08393
T62947
U09564
R88740
M59040
R88740
T94579
H81558
T64012
T86444
H06524
T58861
M59040
L08069
L08540
U19969
M82919
M82919
L06895
60
50
40
30
20
10

FIG. 9

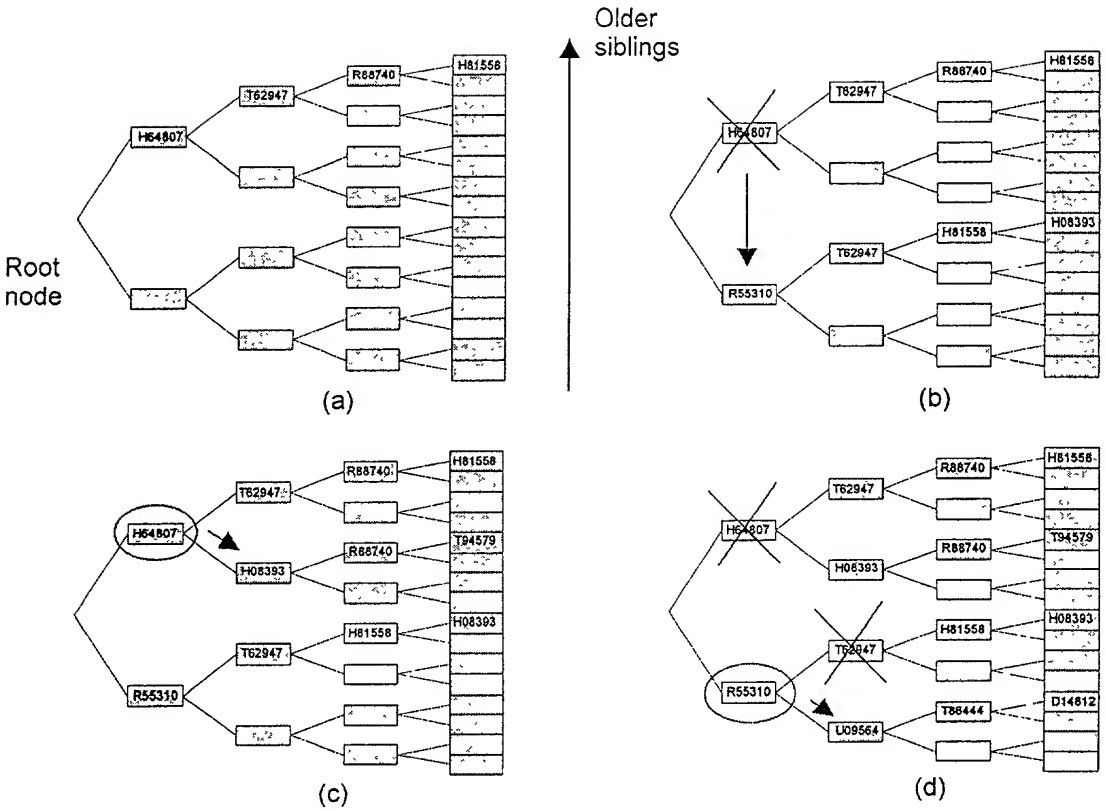
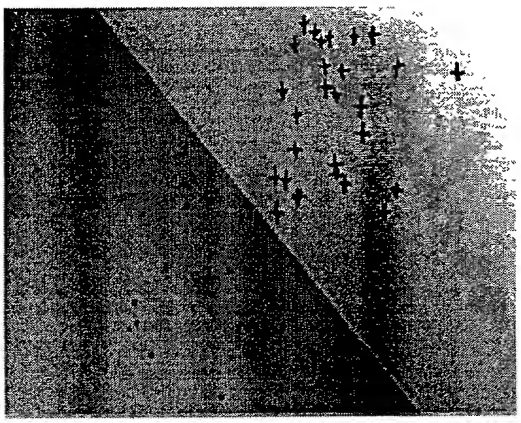
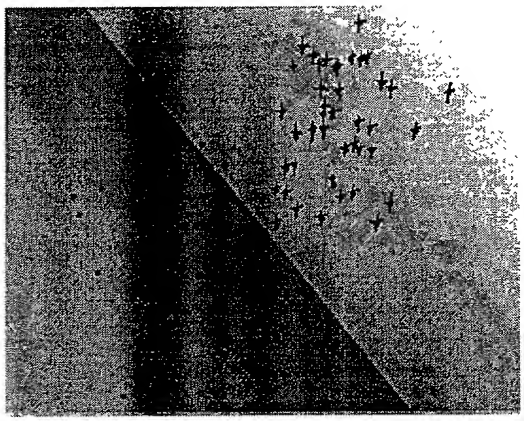

Older
siblings
Root
node
H64807
T62947
R88740
H81558
H08393
T94579
R55310
D14812
U09564
T86444
(a)
(b)
(c)
(d)

FIG. 10

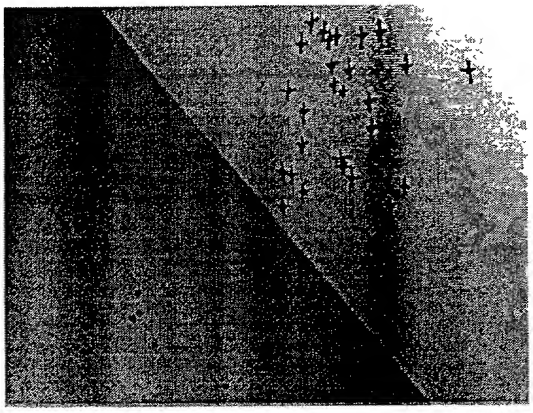
1005784 - 082508



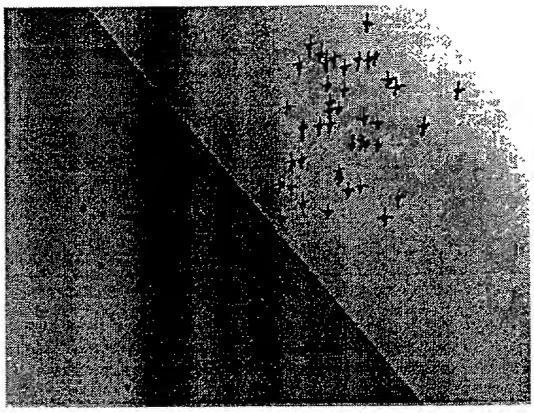
(a)



(b)



(c)



(d)

FIG. 11

Patent Application Publication

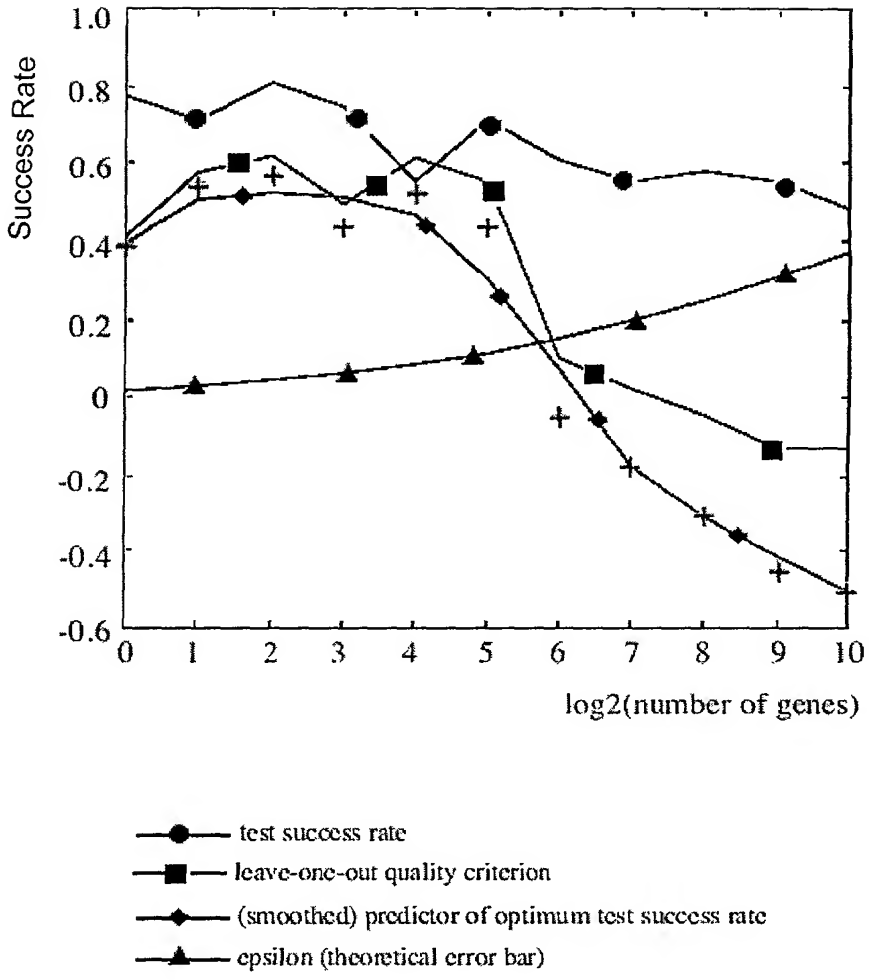


FIG. 12

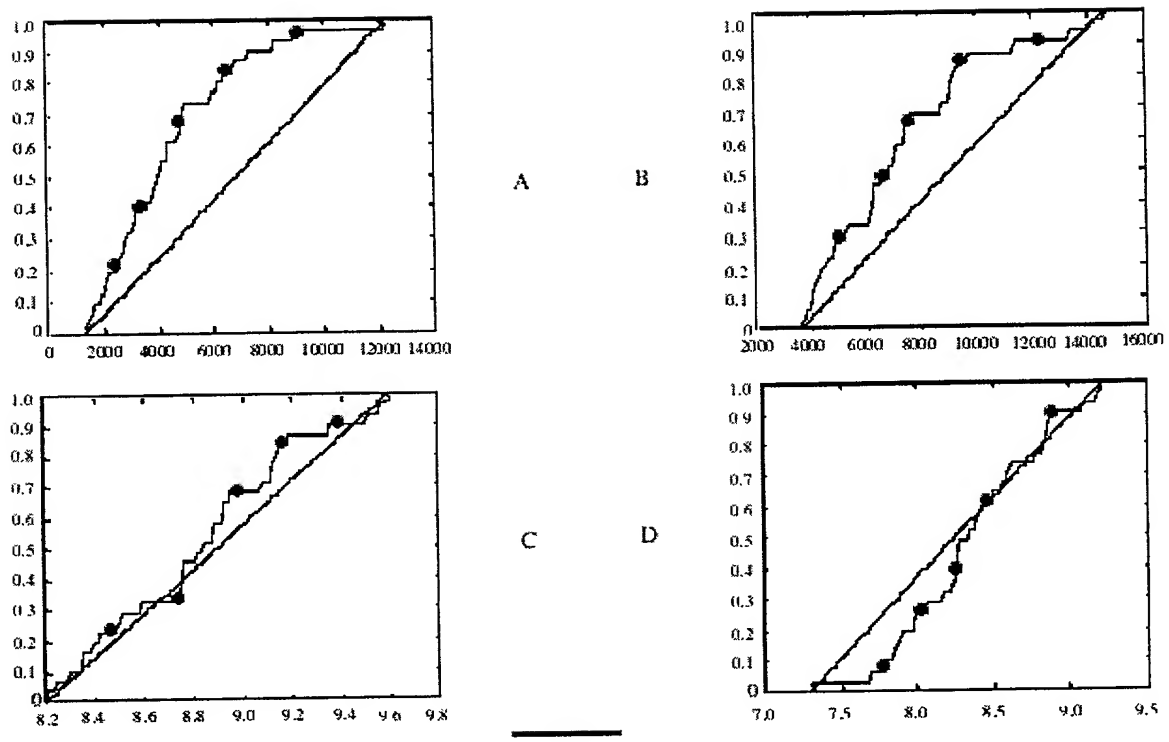


FIG. 13

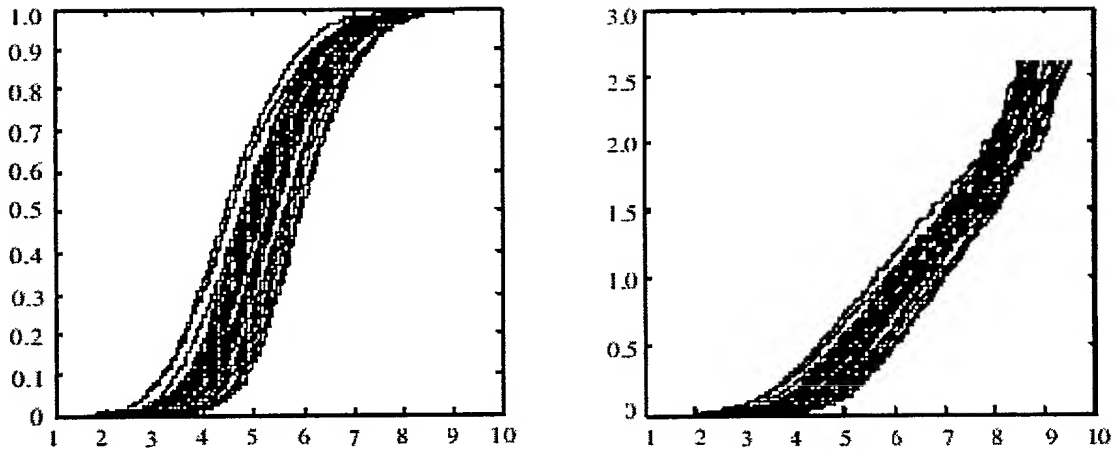

1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1 2 3 4 5 6 7 8 9 10
A
3.0
2.5
2.0
1.5
1.0
0.5
0
1 2 3 4 5 6 7 8 9 10
B

FIG. 14

09576916 - 050705

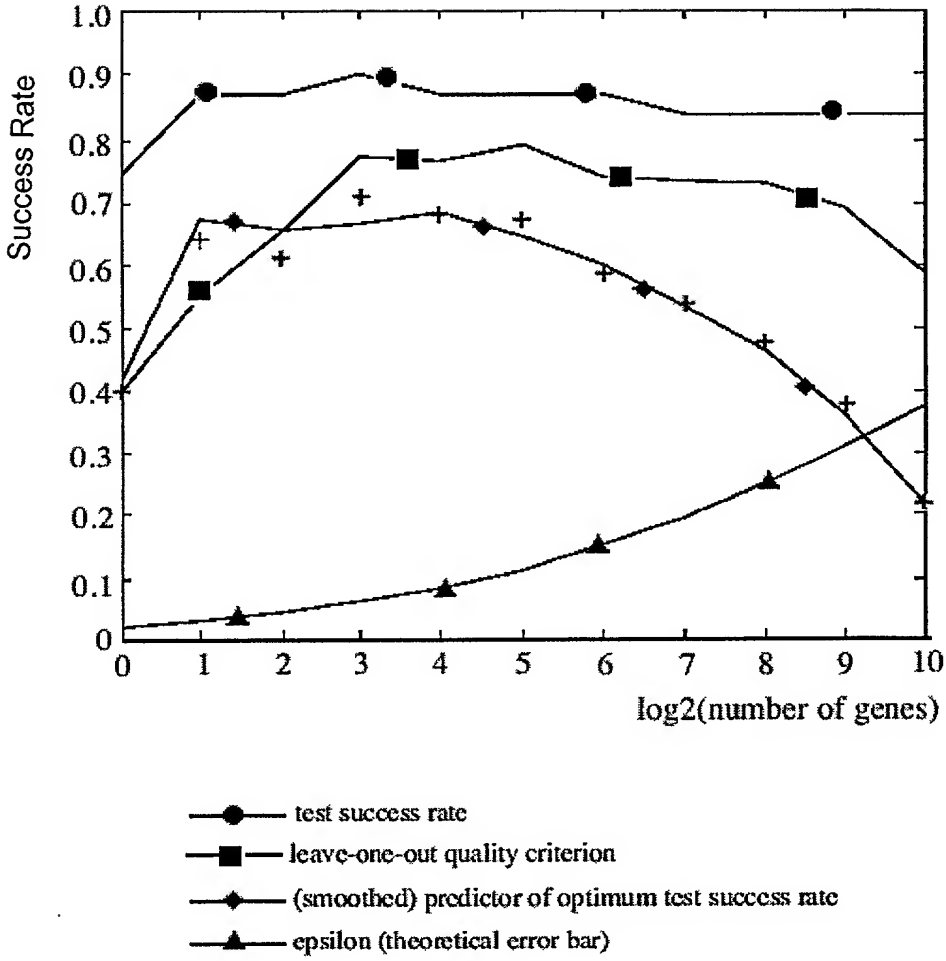


FIG. 15

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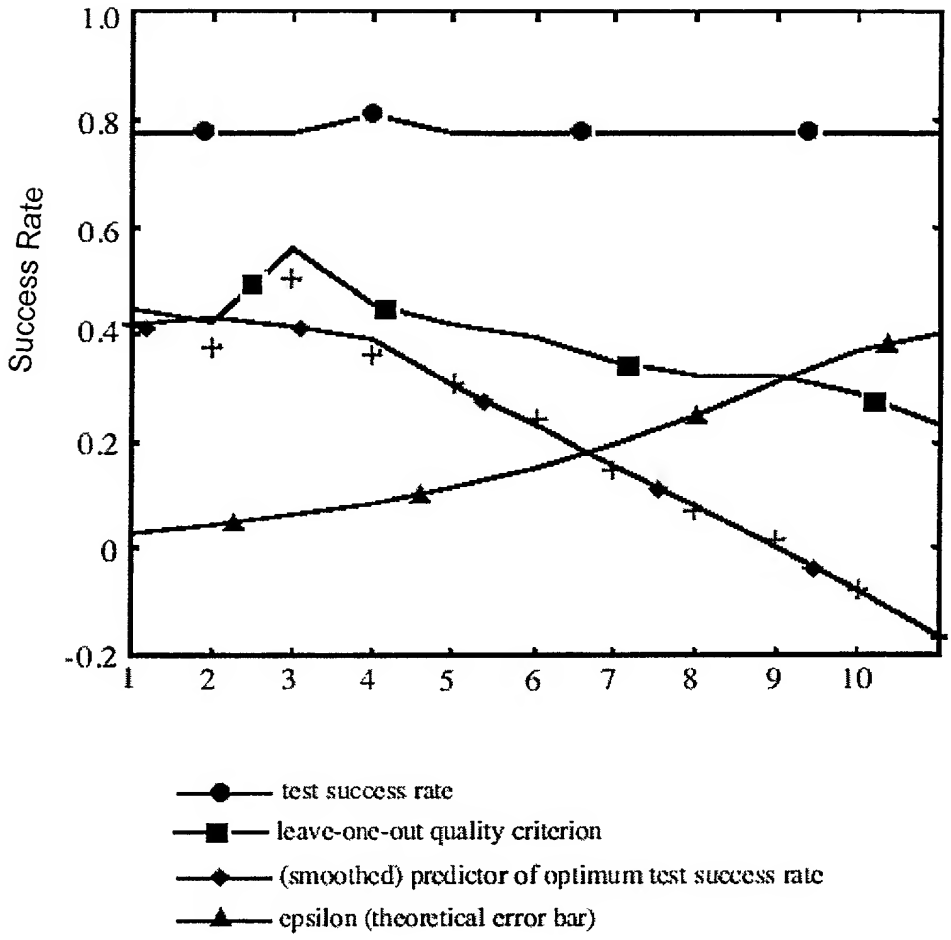


FIG. 16

1005945.050202

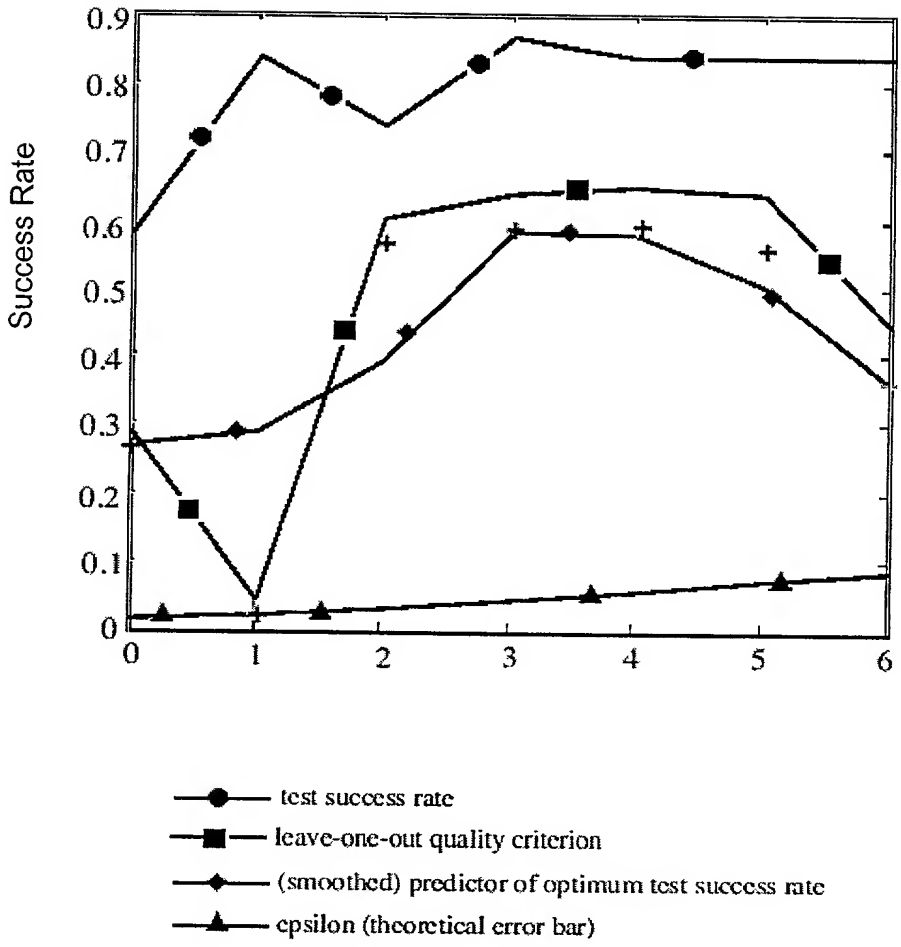


FIG. 17

US 6,957,195 B1

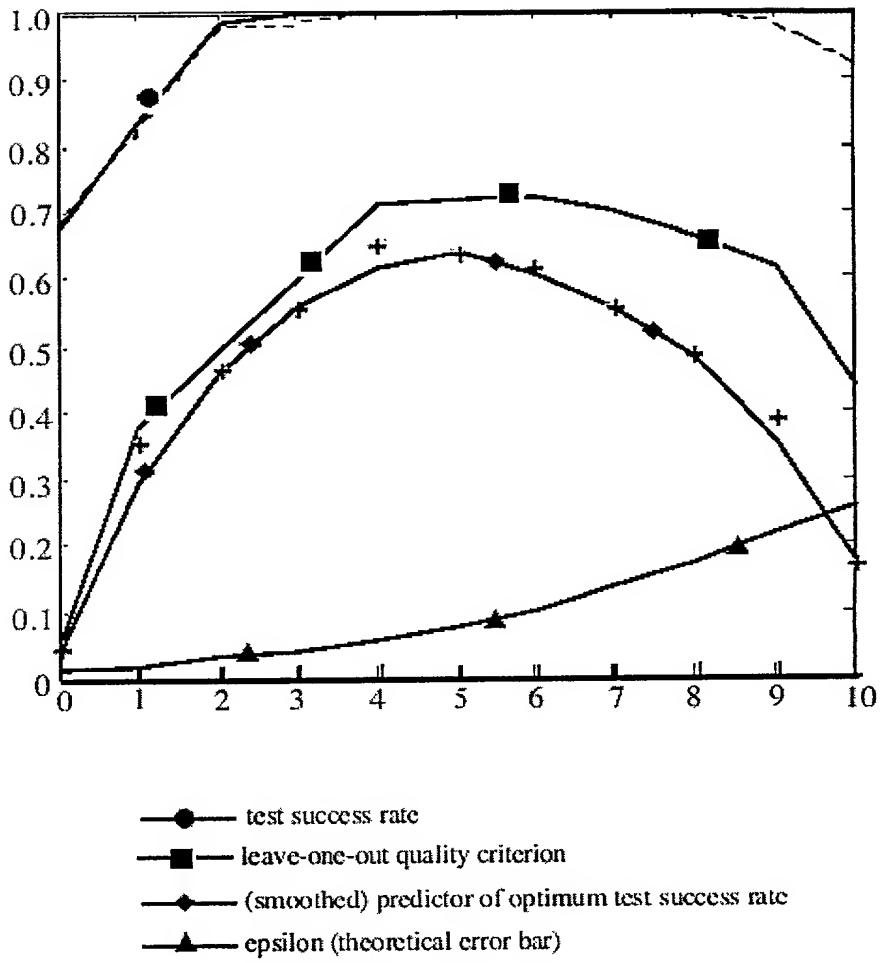


FIG. 18

Application No. 09/756,969

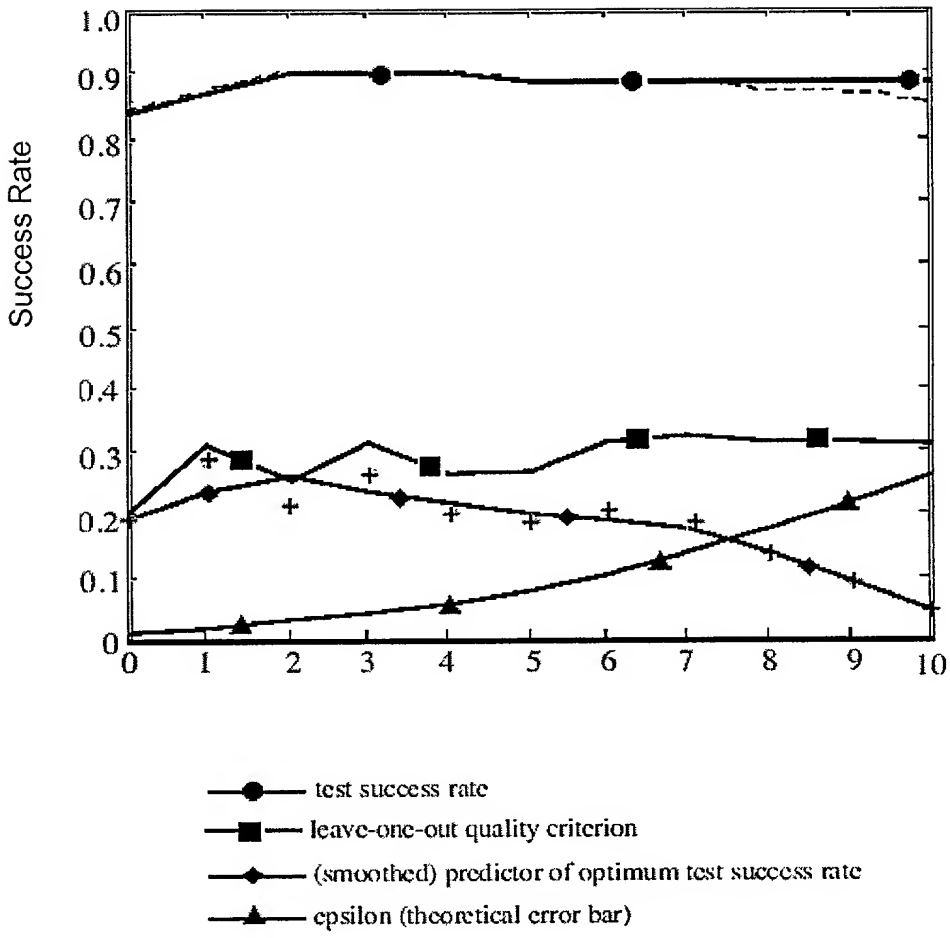


FIG. 19

US 6,958,225 B2

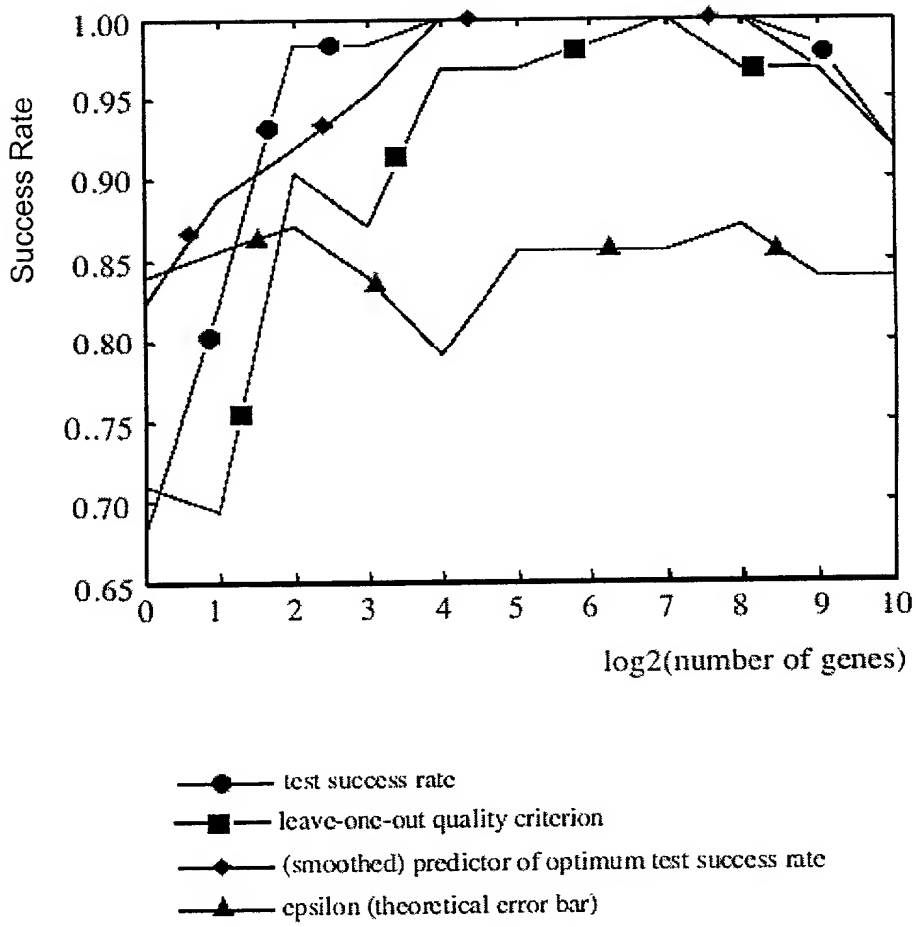


FIG. 20

US 2003/0194705 A1

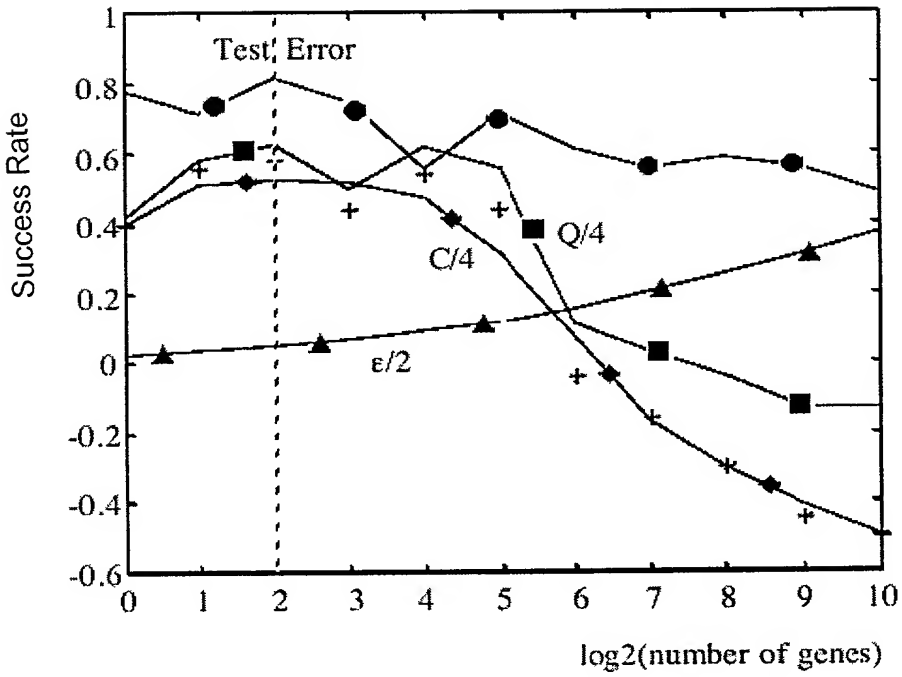


FIG. 21

EFS Web - Page 39 of 39

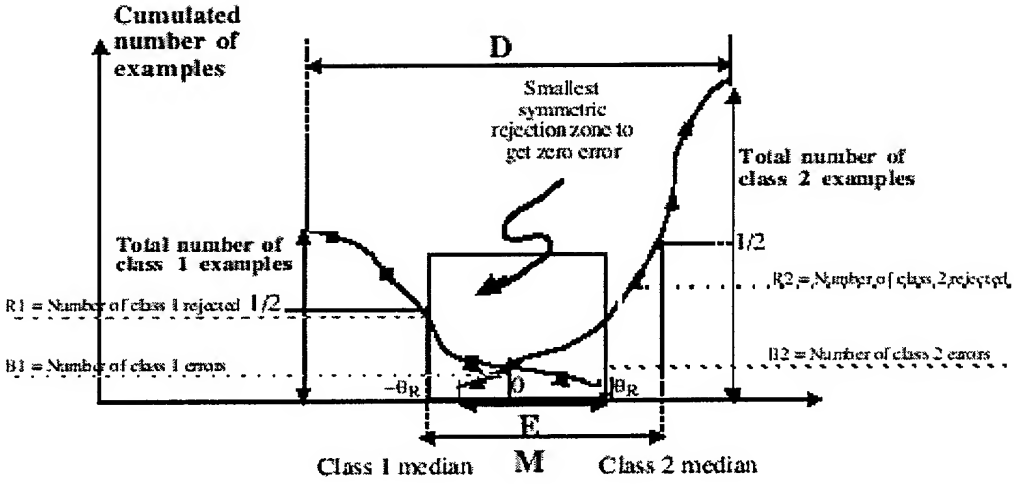
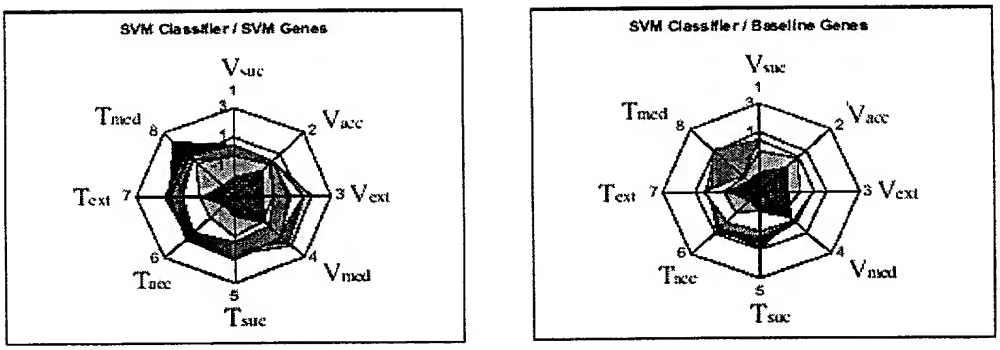
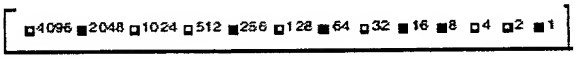
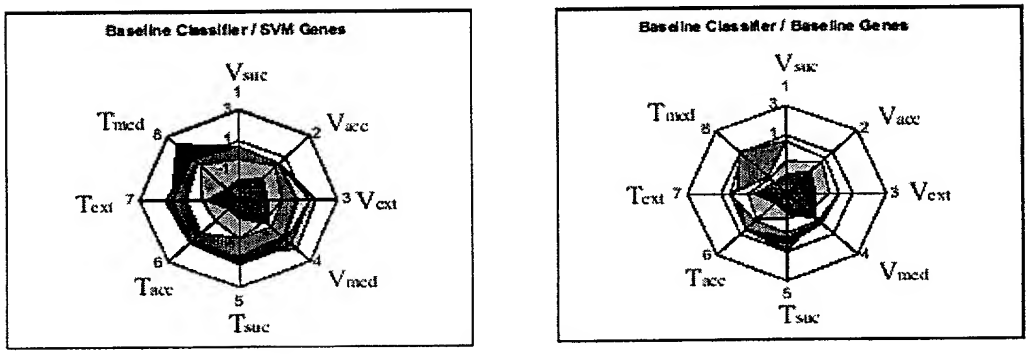


FIG. 22


SVM Classifier / SVM Genes
SVM Classifier / Baseline Genes
Vsuc
Vacc
Vext
Vmed
Tsuc
Tacc
Text
Tmed
1
2
3
4
5
6
7
8

A


4096 2048 1024 512 256 128 64 32 16 8 4 2 1
Numbers of genes


Baseline Classifier / SVM Genes
Baseline Classifier / Baseline Genes
Vsuc
Vacc
Vext
Vmed
Tsuc
Tacc
Text
Tmed
1
2
3
4
5
6
7
8

B

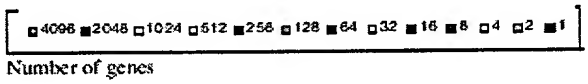
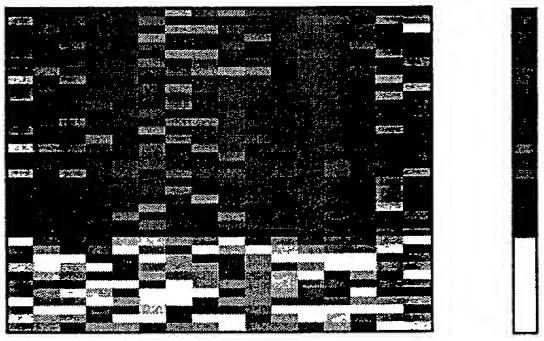
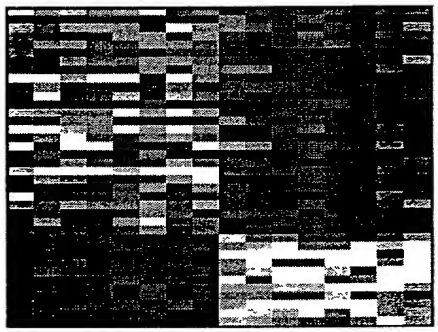

4096 2048 1024 512 256 128 64 32 16 8 4 2 1
Number of genes

FIG. 23



A

B



C

D

FIG. 24

4055450.1 050505-0150

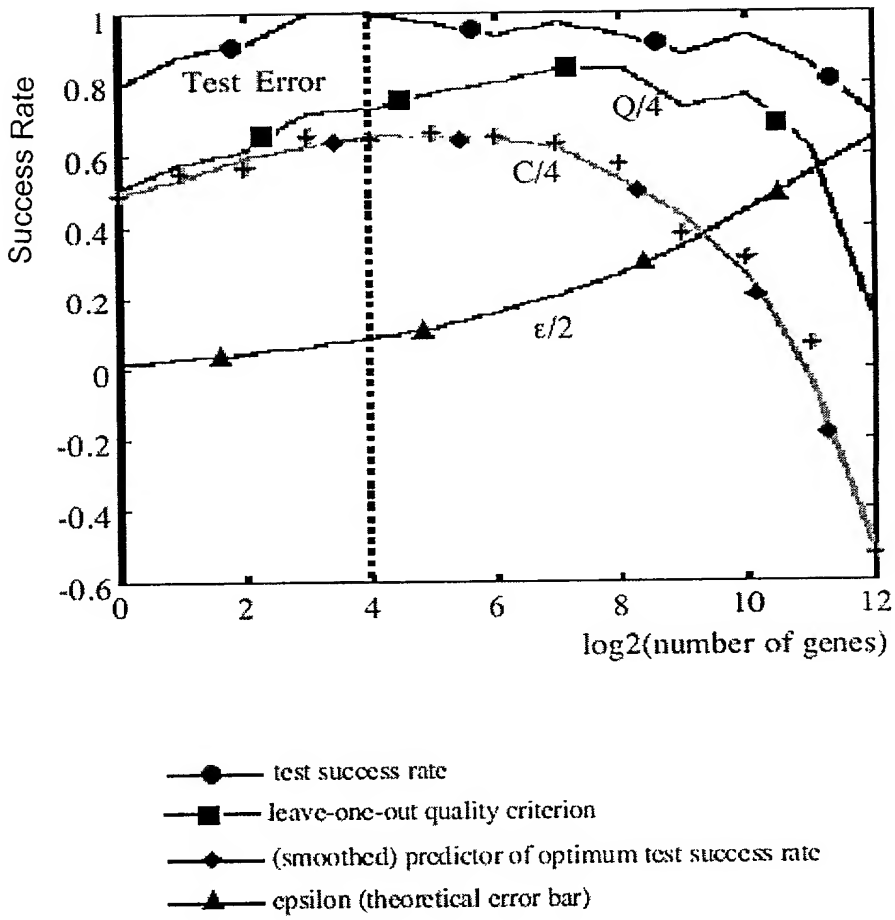


FIG. 25

10057848.020504

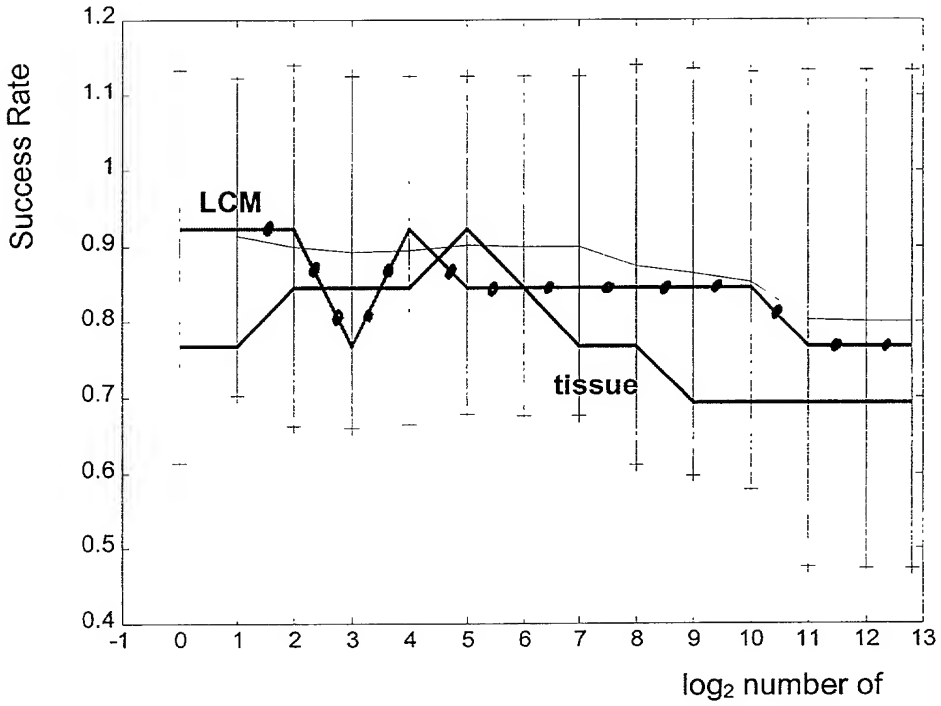


FIG. 26

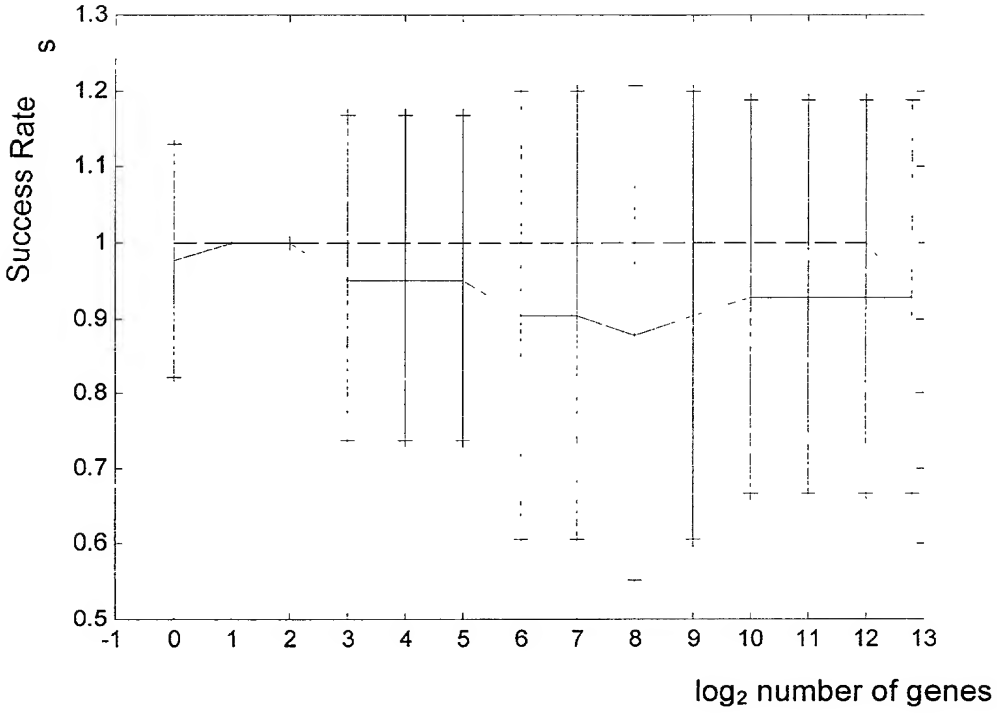

Success Rate s
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
-1 0 1 2 3 4 5 6 7 8 9 10 11 12 13
log2 number of genes

FIG. 27

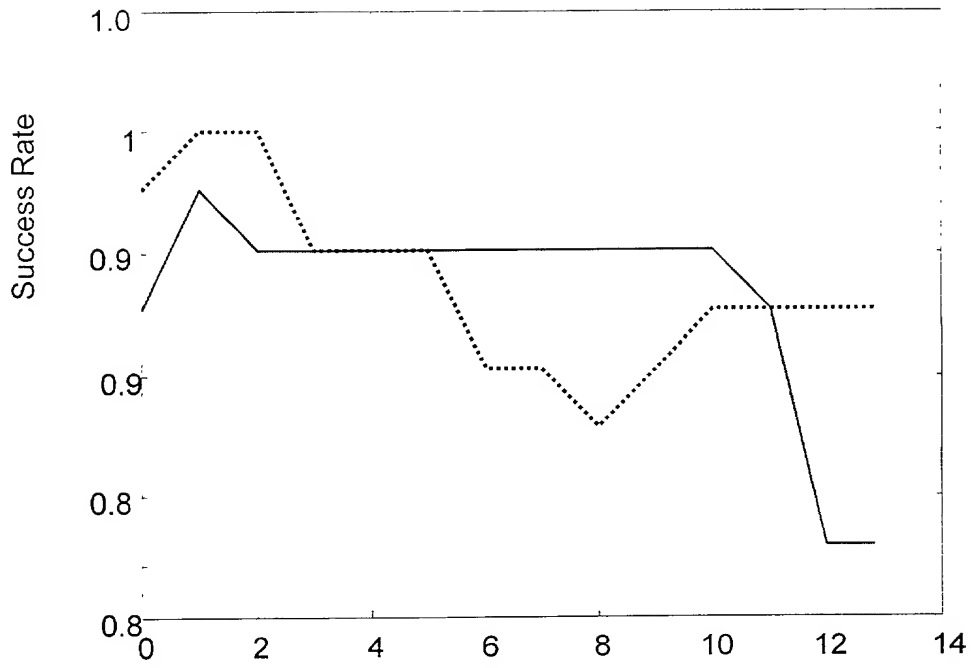


FIG. 28

US 2005/0045801 A1

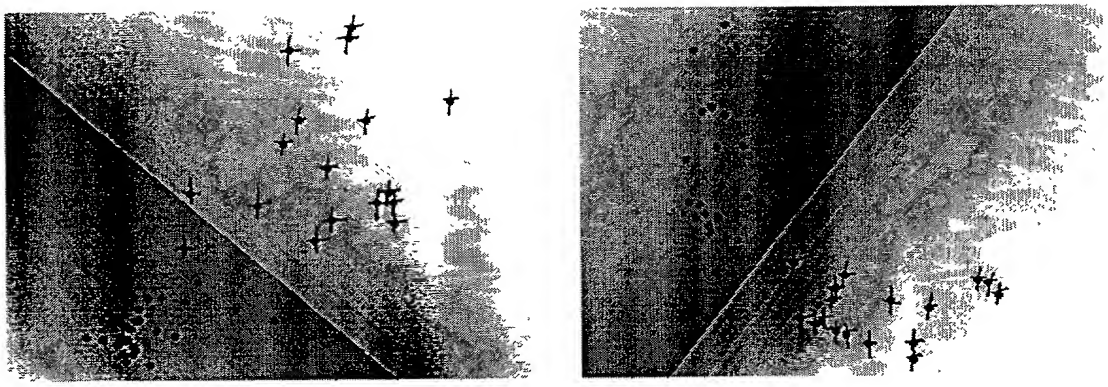


FIG. 29

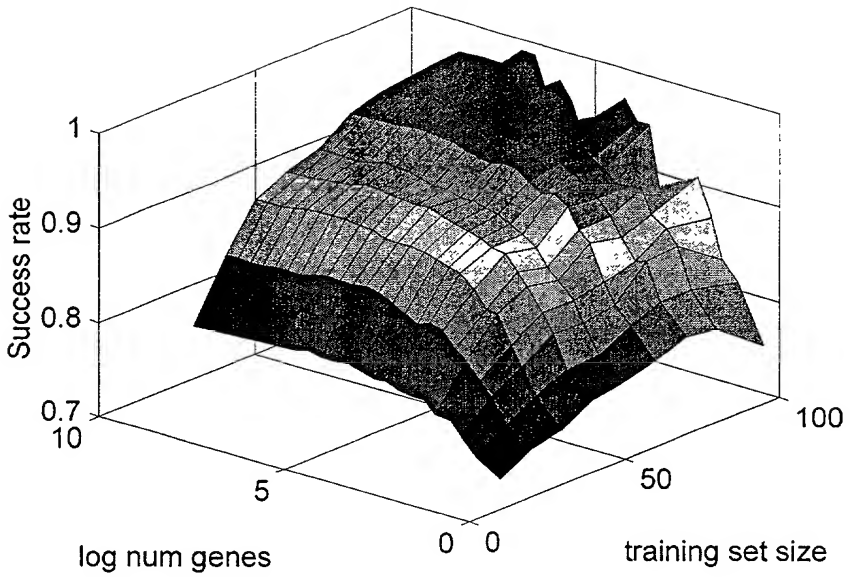

Success rate
1
0.9
0.8
0.7
10
5
0
log num genes
0
50
100
training set size

FIG. 30

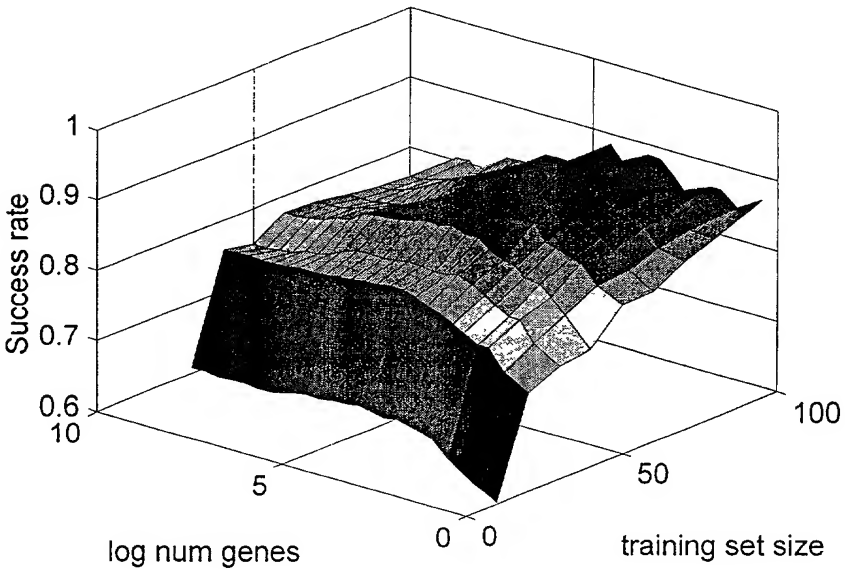

Success rate
1
0.9
0.8
0.7
0.6
10
5
0
log num genes
0
50
100
training set size

FIG. 31